ENGINEERING EVALUATION
P#17857-A#14778
City of Suisun Fire Department
621 Pintail Drive
Suisun City, CA 94585

BACKGROUND

Suisun City Fire Department has applied for a permit to operate an existing standby generator powered by a propane engine (S-1).

S-1 Emergency Standby Generator Set: Propane Engine Make: General Motors; Model: 50RZG; Rated Horsepower: 89 HP; Model Year: 2006

This Generator Set will be located at 621 Pintail Drive, CA 94585. It will provide emergency power (in the event of a blackout) at Suisun City Fire Department. The emergency engine must be periodically tested to ensure that it will generate electricity during an emergency outage.

ABATEMENT DEVICE (Non-Selective Catalyst):

The Suisun City Fire Department is going to install the abatement device on this engine to reduce the emissions to meet the trigger level. In the effect of this air purifier the emissions from the above engine will be reduced as indicated below in Table(1)

Table (1)

Component	Emissions Before Abatement Device Installation g/bhp-hr	Emissions After Abatement Device Installation g/bhp-hr	Percentage Reduction %
NOx	7.00	1.50	78.6
CO	27.40	2.00	92.7
POC	1.10	0.55	50.0

EMISSIONS SUMMARY

Annual Emissions:
The 89 HP engine will run on Liquid Petroleum Gas. The fuel consumption rate is 7.97 gal/hr. Engine emissions are provided by the vendor and listed below in Table (1). For this report, it is assumed that the vendor's given emission value of Total Unburned Hydrocarbons (HC) is equivalent to the emission value of POC. Suisun City Fire Department is allowed to operate the engine for maintenance and reliability-related activities for up to 100 hr/yr.

Table (1)

Emission Factors		
Component	Emission (g/kw·hr)	Emission (g/bhp·hr)
NOx	2.012	1.50
CO	2.682	2.0
POC	0.738	0.55
PM_{10}	negligible	negligible

The emission factor for SO2 is from Chapter 3, Table 3.2-3 of the EPA Document AP-42, Compilation of Air Pollutant Emission Factors. The emissions of SO2 from a 4-stroke rich burn natural gas engine will be used to approximate the SO2 emissions from the propane engine.

SO2 5.88E-4 lb/MMBtu

SO2 = (5.88E-4 lb/MMBtu)(295 scf/hr)(2520 BTU/scf)(MMBtu/1E6 Btu)(100 hr/yr)
= 0.044 lb/yr = 0.000022 TPY

Maximum Emissions in Tons per year:

Table (2)

Maximum Emissions in Tons per year
NOx = (1.50 g/bhp-hr)(89 hp)(100 hrs/yr)(1lb/453.6g) = 29.43 lb/yr = 0.015 TPY
CO = (2.00 g/bhp-hr)(89 hp)(100 hrs/yr)(1lb/453.6g) = 39.24 lb/yr = 0.020 TPY
POC = (0.55 g/bhp-hr)(89 hp)(100 hrs/yr)(1lb/453.6g) = 10.79 lb/yr = 0.005 TPY
PM10 = (0.00 g/bhp-hr)(89 hp)(100 hrs/yr)(1lb/453.6g) = 0.00 lb/yr = 0.000 TPY

Maximum Daily Emissions:

A full 24-hour day will be assumed since no daily limits are imposed on intermittent and unexpected operations. Check Table (3) for emissions per day.

Table (3)

Maximum Daily Emissions
NOx = (1.50 g/bhp-hr)(89 hp)(24 hrs/day)(1lb/453.6g) = 7.063 lb/day
CO = (2.00 g/bhp-hr)(89 hp)(24 hrs/day)(1lb/453.6g) = 9.418 lb/day
POC = (0.55 g/bhp-hr)(89 hp)(24 hrs/day)(1lb/453.6g) = 2.590 lb/day
PM10 = (0.00 g/bhp-hr)(89 hp)(24 hrs/day)(1lb/453.6g) = 0.000 lb/day

SO2 = (5.88E-4 lb/MMBtu)(295 scf/hr)(2520 BTU/scf)(MMBtu/1E6 Btu)(24 hr/day)
= 0.010 lb/day

Plant Cumulative Increase: (tons/year): Cumulative increase from the plant is as shown in Table (4).

Table (4)

Plant Cumulative Increase			
Pollutant	Existing tons/yr.	New tons/yr.	Total tons/yr.
NOx	0	0.015	0.015
CO	0	0.020	0.020
POC	0	0.005	0.005
PM10	0	0.000	0.000
SO_2	0	0.000022	0.000022
NPOC	0	0.000	0.000

Toxic Risk Screening:
EPA AP-42 Compilation of Air Pollutant Emission Factors does not have a chapter or emission factors for liquefied petroleum gas fired engines. Chapter 1.5 Liquid Petroleum Gas (LPG) Combustion contains emission factors for industrial and commercial boilers only. The District database uses generalized factors that appear to be based on natural gas for LPG toxic emissions. Emissions factors for a 4-stroke rich-burn natural gas engine will be used to estimate the emissions from the propane fired engine. Emissions factors are from EPA AP-42 Table 3.2-3. As seen in Appendix A of this report, no toxic air contaminants exceed the District Risk Screening Trigger levels, therefore Risk Screening Analysis is not required.

Appendix A

Toxic Air Contaminants from S-1 Emergency Standby Generator AP-42 Emissions for Liquid Petroleum Gas fired Engines 3.2 Uncontrolled Emission Factors for 4-Stroke Rich-Burn Engines

Compound Name	Emission Factor lb/MMBtu (Fuel Input)	Calculated Emission	Abatement Efficiency	Abated Emissions	Total Emission lb/yr	TAC Trigger Levels in lb/yr
1,1,2,2-Tetrachloroethane	2.53E-05	1.92517E-03	0	0	1.92517E-03	3.3
1,1,2-Trichloroethane	1.53E-05	1.16423E-03	0	0	1.16423E-03	1.2
1,1-Dichloroethane	1.13E-05	8.59857E-04	0	0	8.59857E-04	120
1,2-Dichloroethane	1.13E-05	8.59857E-04	0	0	8.59857E-04	120
1,2-Dichloropropane	1.30E-05	9.89216E-04	0	0	9.89216E-04	
1,3-Butadiene	6.63E-04	5.04500E-02	0	0	5.04500E-02	1.1
1,3-Dichloropropene	1.27E-05	9.66387E-04	0	0	9.66E-04	
Acetaldehyde	2.79E-03	2.12301E-01	0	0	2.12301E-01	72
Acrolein	2.63E-03	2.00126E-01	0	0	2.00126E-01	3.9
Benzene	1.58E-03	1.20228E-01	0	0	1.20228E-01	6.7
Butyr/Isobutyraldehyde	4.86E-05	3.69814E-03	0	0	3.69814E-03	
Carbon Tetrachloride	1.77E-05	1.34685E-03	0	0	1.34685E-03	4.6
Chlorobenzene	1.29E-05	9.81606E-04	0	0	9.81606E-04	14000
Chloroform	1.37E-05	1.04248E-03	0	0	1.04248E-03	36
Ethane	7.04E-02	5.35698E+0	0	0	5.35698E+00	

		0				
Ethylbenzene	2.48E-05	1.88712E-03	0	0	1.88712E-03	
Ethylene Dibromide	2.13E-05	1.62079E-03	0	0	1.62079E-03	2.7
Formaldehyde	2.05E-02	1.55992E+00	0	0	1.55992E+00	33
Methanol	3.06E-03	2.32846E-01	0	0	2.32846E-01	120000
Methylene Chloride	4.12E-05	3.13505E-03	0	0	3.13505E-03	190
Naphthalene	9.71E-05	7.38868E-03	0	0	7.38868E-03	270
PAH	1.41E-04	1.07292E-02	0	0	1.07292E-02	0.044
Styrene	1.19E-05	9.05513E-04	0	0	9.05513E-04	140000
Toluene	5.58E-04	4.24602E-02	0	0	4.24602E-02	39000
Vinyl Chloride	7.18E-06	5.46351E-04	0	0	5.46351E-04	2.5
Xylene	1.95E-04	1.48382E-02	0	0	1.48382E-02	58000

Public Notice: This site is within 1000' of a school therefore the public notification is required.

STATEMENT OF COMPLIANCE

The owner/operator of S-1 shall comply with Reg. 6 (Particulate Matter and Visible Emissions Standards) and Reg. 9-1-301 (Inorganic Gaseous Pollutants: Sulfur Dioxide for Limitations on Ground Level Concentrations). The owner/operator is expected to comply with Regulation 6 since the unit is fueled with liquefied petroleum gas (propane). Thus, for any period aggregating more than three minutes in any hour, there should be no visible emission as dark or darker than No. 1 on the Ringlemann Chart (Regulation 6-301) and no visible emission to exceed 20% opacity (Regulation 6-302). Chapter 1.5 does state that LPG is considered a "clean" fuel because it does not produce visible emissions. Sulfur oxides are also very low since propane is being used to fire the compressor. Because S-1 is an emergency standby generator, Reg. 9-8-110 (Inorganic Gaseous Pollutants: Nitrogen Oxides from Stationary Gas Turbines) exempts the source from the requirement of Sections 9-8-301, 302, and 502. Allowable operating hours and the corresponding record keeping in Reg. 9-8-330 and 530 will be included in the Permit Conditions below.

The project is considered to be ministerial under the District's CEQA regulation 2-1-311 and therefore is not subject to CEQA review.

Best Available Control Technology: In accordance with Regulation 2, Rule 2, Section 301, BACT is triggered for any new or modified source with the potential to emit 10 pounds or more per highest day of POC, NPOC, NOx, CO, SO_2 or PM_{10}. Based on daily (24 hour) emissions calculation above, BACT is not required for this source S-1.

Offsets: Offsets must be provided for any new or modified source at a facility that emits more than 15 tons/yr of POC or NOx. Based on the annual emission calculations above, offsets are not required for this application. PSD, NSPS, and NESHAPS do not apply.

PERMIT CONDITIONS

Condition Number 23174 for S-1 Emergency Standby Generator Set, at Plant #17857

1. The owner or operator shall operate S-1, stationary emergency standby engine, only to mitigate emergency conditions or for reliability-related activities (maintenance and testing). Operating while mitigating emergency conditions and while emission testing to show compliance with this part is unlimited. Operating for reliability-related activities are limited to 100 hours per year.

   (Basis: Emergency Standby Engines, Hours of Operation Regulation 9-8-330)

2. The Owner/Operator shall equip the emergency standby engine(s) with:
   a. a non-resettable totalizing meter that measures hours of operation or fuel usage

   (Basis: Emergency Standby Engines, Monitoring and Recordkeeping 9-8-530)

3. The Owner/Operator shall not operate S-1 unless the Liquid Petroleum Gas fired engine is abated with a Non-Selective Catalytic Converter (3-way catalyst).

4. Records: The Owner/Operator shall maintain the following monthly records in a District- approved log for at least 36 months from the date of entry. Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request.
   a. Hours of operation (maintenance and testing).
   b. Hours of operation for emission testing.
   c. Hours of operation (emergency).
   d. For each emergency, the nature of the emergency condition.
   e. Fuel usage for engine.

   (Basis: Emergency Standby Engines, Monitoring and Recordkeeping 9-8-530)

RECOMMENDATION

Issue an Authority to Construct to City of Suisun Fire Department located at 621 Pintail Drive in Suisun City, CA 94585

EXEMPTIONS
None.

By: Madhav Patil Date: 09/22/2006

Air Quality Engineering Intern

Acronyms			
S	Source	NPOC	Non- Precursor Organic Compound
HP	Horse Power	TBACT	Best Available Control Technology for Toxics
CARB	California Air Resource Board	BACT	Best Available Control Technology
NOx	Oxides of Nitrogen as NO_2	BAAQMD	Bay Area Air Quality Management District
CO	Carbon Monoxide	IC Engines	Internal Combustion Engines
POC	Precursor Organic Compound	EPA	Environmental Protection Agency
HC	Hydrocarbons	SCR	Selective Catalytic Reduction
PM_{10}	Particulate Matter	PSD	Prevention of Significant Deterioration
SO_2	Sulfur Dioxide	NSPS	New Source Performance Standard
O_2	Oxygen	NESHAPS	National Emission Standard for Hazardous Air Pollutants
ppmv	parts per million by volume	CEQA	California Environmental Quality Act
ATCM	Airborne Toxic Control Measure		